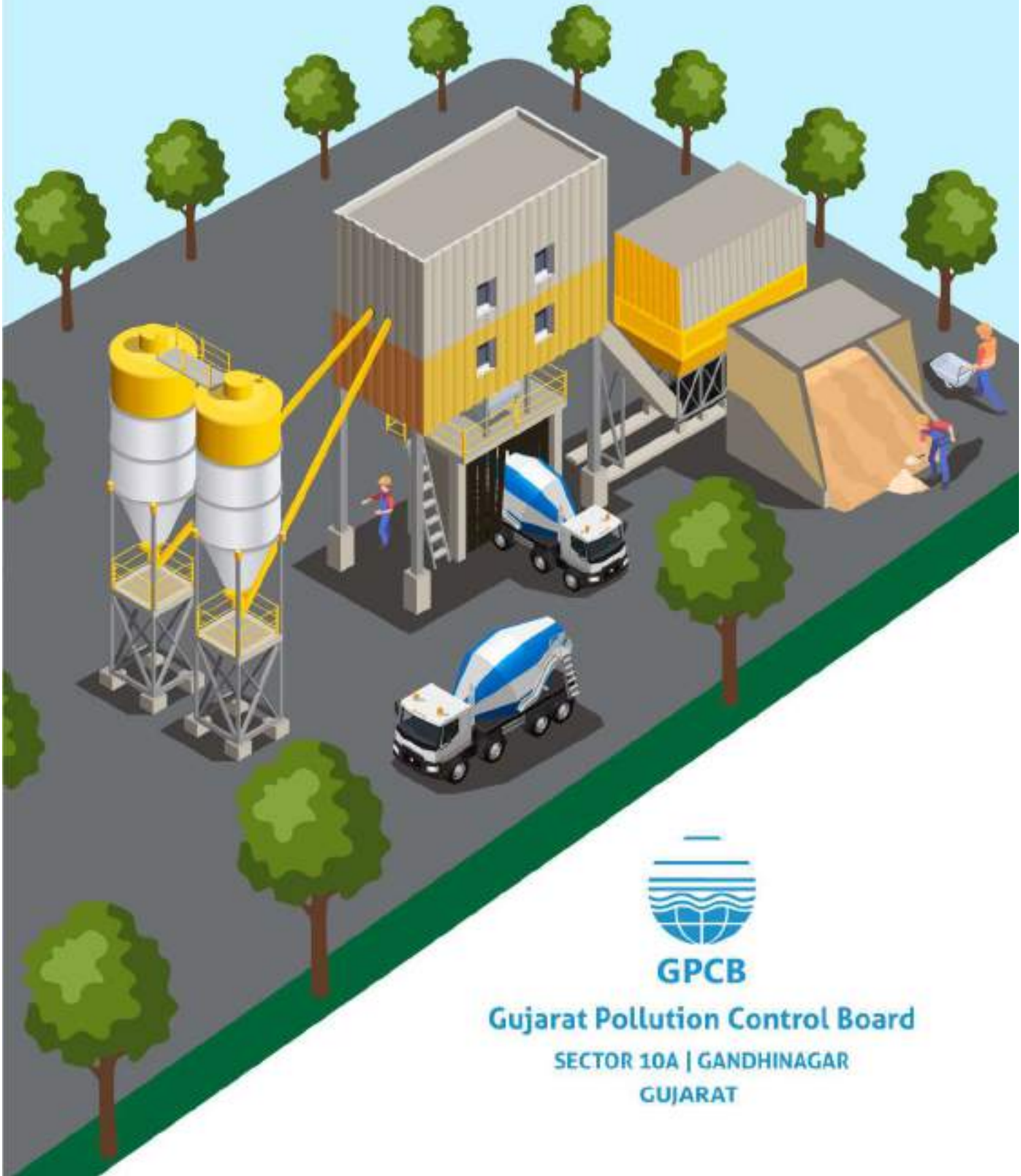
Environmental Guidelines for
Ready-Mix Concrete (RMC) Plant



GPCB
Gujarat Pollution Control Board
SECTOR 10A | GANDHINAGAR
GUJARAT

Title:

Environmental Guidelines for Ready-Mix Concrete (RMC) Plant

Edition:

July 2024

Under Guidance of:

Shri R B Barad, IAS, Chairman, GPCB

Shri D M Thaker, Member Secretary, GPCB

Expert Members:

Shri Prasoon Gargava, Regional Director, CPCB Vadodara

Prof. Dr. G H Ban, Associate Professor, LD College of Engineering, Ahmedabad

Shri S Karthikeyan, Deputy Executive Director, CII-IGBC

Chairman, Association of Ready Mix Concrete Manufacturer, Gujarat

RMC Plant Manufacturer

Team Members:

Shri R V Patel, SEE, GPCB

Shri Prathmesh Patel, DEE, GPCB

Shri Pavankumar Sharma, DEE, GPCB

Disclaimer:

The purpose of this guideline is to standardize the process and provide guidance to the ready-mix concrete (RMC) plants for improved environmental performance. This document does not entitle any entity for any sort of relaxation / exemption from anything prescribed under any law/rules. This guideline is based on general and publicly available information & practices for reference purpose. The usage of this document is suggested along with relevant applicable Acts, Rules, Notifications, Circulars, Office Orders, and Policies issued and amended from time to time.

TABLE OF CONTENT

List of Figures

ABBREVIATION

APCM:	Air Pollution Control Measures
CPCB:	Central Pollution Control Board
CTE:	Consent to Establishment
CCA:	Consolidated Consent and Authorization
EMS:	Environmental Management System
GGBS:	Ground Granulated Blast-furnace Slag
GPCB:	Gujarat Pollution Control Board
PM:	Particulate Matter
RMC:	Ready-Mix Concrete
TM:	Transit Mixer

1 Introduction

The second most used resource after water is concrete, which is one of the key raw materials used for civil engineering structural projects in India and around the world [1]. It is also one of the greatest materials ever developed by humans. In the world of construction; efficiency, quality, and speed are paramount. Concrete is typically divided into two categories based on its location of preparation: Onsite-Mixed Concrete and Ready-Mixed Concrete.

Ready-Mix Concrete (RMC) plant is one of the innovations that has revolutionized the way concrete is prepared and delivered to construction sites. These plants have gained immense popularity in recent years due to their numerous advantages, fundamentally transforming the construction landscape. Most significant construction endeavours make use of ready-mix concrete to speed up construction, improve quality, and increase durability.

2 Need of Guidelines

In recent years, the Government of Gujarat has prioritized infrastructure development to support economic growth and attract investment. Gujarat is the most industrialized state in India and has been recognized nationally and globally for offering a conducive business ecosystem that is supported by Ease of Doing Business (EoDB) and state-of-the-art infrastructure. Rapid urbanization coupled with industrialization has triggered demand for RMC plants in the recent past.

RMC plants are often located near construction sites in urban areas for logistics reasons. Due to this proximity, there are higher chances, particularly in outgrowth areas of the city, that other occupied residential properties will be close to the plant, putting inhabitants at risk of exposure to pollutants and noise.

In Gujarat, many RMC plants have come up, and it is assumed that more such plants will come up in the future. Surat, Ahmedabad, Gandhinagar, Vadodara and Bharuch districts have higher number of RMC plants. The proliferation of RMC plants is a resultant of the construction industry's need for more efficient, cost-effective, and reliable concrete supply solutions at a reasonable distance from the place of use.

In Gujarat, at present there are no guidelines available which cover Environmental Management System (EMS) aspects of the RMC plant. To streamline and standardize the technical and Environmental Management System (EMS) aspects of a RMC plant, there is a need to frame a specific guideline which cover all relevant technical points regarding EMS.

3 Aim of Guidelines

Ready-mix concrete plays a vital role in the development; on the other hand, it is also a potential source of significant "dust emission". So, through this guidelines attempt is made to cover the required measures to prevent/control fugitive emissions and point source emissions from the RMC plant and to have environmentally sound development.

Environmental guidelines for RMC plants are crucial to minimize their impact on the environment and surrounding communities. This guideline aims to control pollution, promote sustainable practices, and ensure compliance with local regulations.

4 Scope of Guidelines

This guideline shall be applicable to all existing and upcoming RMC plants in the state of Gujarat.

5 About Ready-Mix Concrete (RMC) Plant

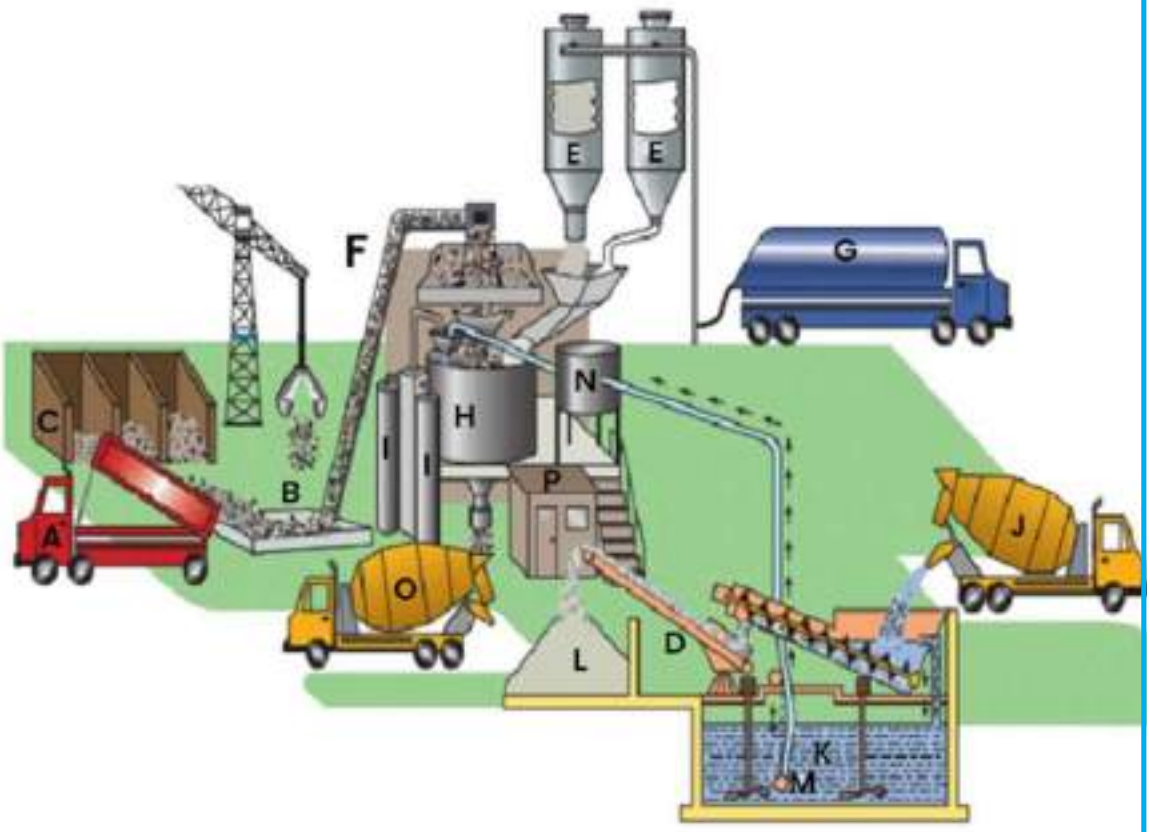
5.1 Working Principle of RMC Plant

A RMC plant, also known as a concrete batching plant, is a facility that combines various ingredients viz. cement, sand, coarse and fine aggregate, admixtures, water etc. to form concrete. Batching is the process of weighing and introducing the desired proportion of ingredients into a mixer for developing a batch of concrete. The mixing process occurs in the plant, and once the concrete is thoroughly ready, it is transported to construction sites in specialized trucks known as transit mixer (T.M.).

The working principle of a RMC plant involves precise measurement, controlled mixing, and efficient transportation to provide construction sites with high-quality ready-to-use concrete, saving time & space at the construction site and labor compared to on-site batching and mixing. Automation and computerized systems are nowadays often used to enhance accuracy and efficiency in the batching and mixing process.

Main components of RMC plant are:

1. **Raw Material Silo for storage of Cement, Fly ash, Ground Granulated Blast-furnace Slag etc.**
2. **Aggregate storage and batching system (Batcher)**
3. **Water storage and pumping system**
4. **Hopper type aggregate feed system**
5. **Material transfer Conveyors/Ducts**
6. **Weighing system**
7. **Concrete Mixer**
8. **Dust collection mechanism**
9. **Control panel**



A : Aggregate Delivery
B : Aggregate Receving Hopper
C : Aggregate Storage
D : Conveyor Belt
E : Cementitious Material Storage
F : Weigh Hopper
G : Cement Delivery
H : Mixer
I : Admixture
J : Ready Mix Truck with returned Concrete
K : Recycled Water
L : Reclaimed Aggregates
M : Pump
N : Water Storage
O : Concrete loaded in Ready-Mix Truck
P : Control Room

Figure 1: Schematic representation of typical RMC plant [2]

5.2 Categorisation of RMC plant:

I. **Off-site RMC Plant (Common RMC Plants):** A concrete batching plant set up for the purpose of supplying RMC to customers who require this for their construction at a location away from the RMC plant.

II. **On-site RMC Plant (Project / site specific RMC Plants usually at Construction / Project site):** A concrete batching plant set up at the site of a dedicated project by a ready-mix concrete manufacturer or contractor or any other agency for the sole purpose of supplying ready-mix concrete to a dedicated project site having construction phase not more than time limit specified in work order / tender document.

5.3 Ready-Mix Concrete Plant Process:

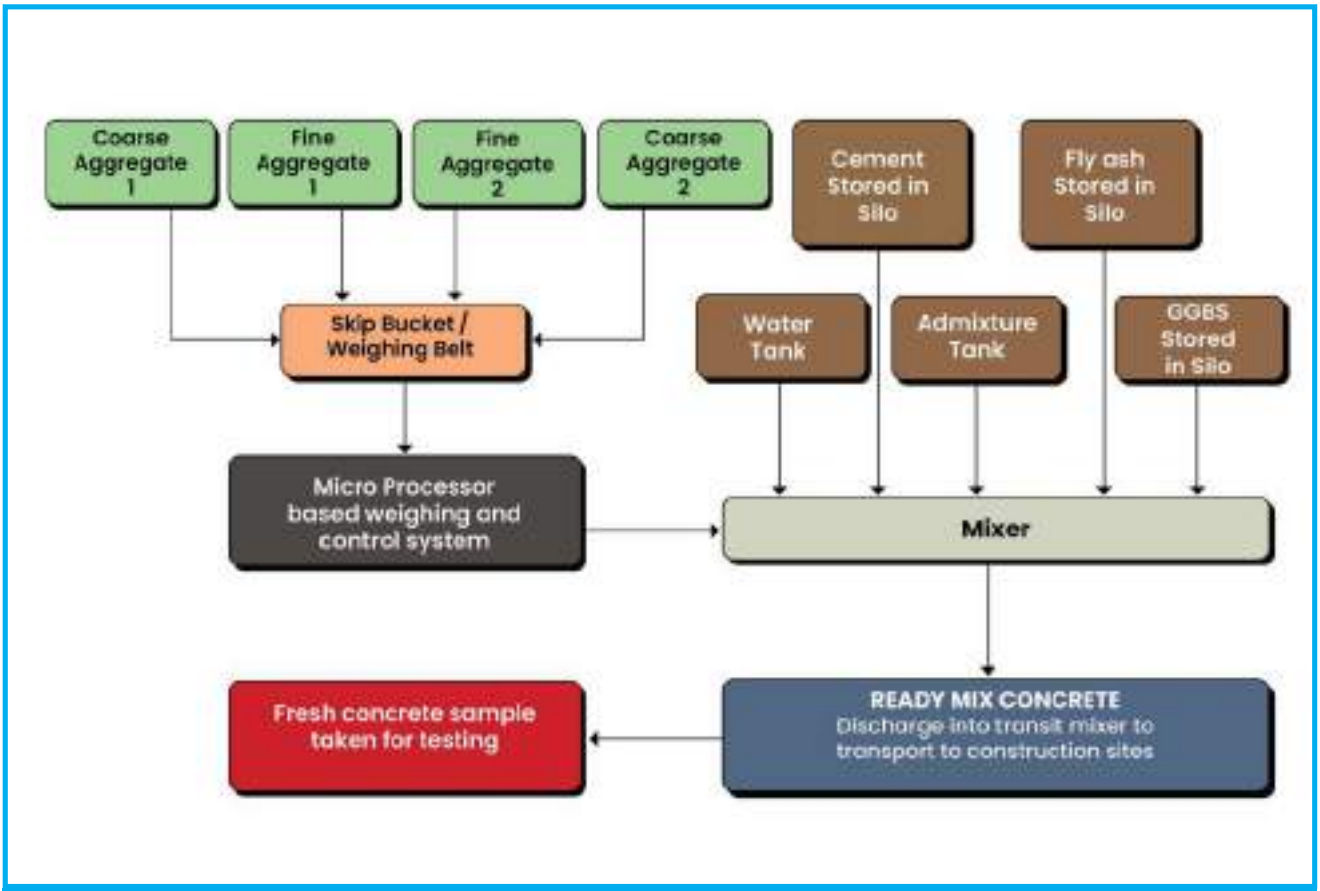


Figure 2: Flow chart of typical RMC plant process

I. Inert raw materials, namely fine aggregates and coarse aggregates are stored as a heap in a closed shed. Cement, Fly Ash, GGBS etc. are stored in the closed silos. Water and admixtures are stored in the tanks / drums.

II. The Inert raw materials are fed into a batching plant mixer by means of conveyor belt. The required quantity of cement, fly ash, GGBS etc. is extracted through a screw conveyor and fed into a mixer. Water and admixture are pumped as per requirement into a mixer.

III. After the mixing is completed, the ready-mix concrete is discharged into a transit mixer (T.M.) which will transport the concrete to the construction site.

5.4 Environmental issues associated with Ready-Mix Concrete plant

I. The major environmental issue due to operation of the RMC plant is fugitive dust emission while loading/ unloading of materials, from storage of materials, transfer of materials and while mixing of materials.

II. Wastewater is generated from plant washing, transit mixer washing, vehicles tyre washing and floor washing.

III. Solid waste generated from transit mixture washing, muck (debris/ sludge) generated from RMC.

IV. Noise pollution while loading/ unloading of materials, transfer of material and during the mixing process.

6 Environmental Guidelines for Ready-Mix Concrete Plant

A. Siting Criteria

I. Off-site RMC plants are considered under the green category as per CPCB classification, hence siting criteria shall be applicable as per the Board's prevailing rules / policy for green category.

II. On-site RMC plants where the project proponent requires to set up RMC plant at site needs to apply to the Board. The Board officer will assess the need and may give permission based on merit, if need be, with extra precautionary conditions. However, in no such case, such RMC plant should be installed at a distance less than 50 meters from a habitation / educational institute / hospital / receptors.

B. Air Pollution Control Measures

I. All aggregates (such as sand, gravel, or crushed stone) shall be accepted by properly covered vehicles (i.e. the top of the vehicle must be covered by flexible tarpaulin / synthetic fibre / plastic sheet etc.) to prevent fugitive emissions while transporting.

Figure 3: Raw material vehicle covered by flexible tarpaulin

II. All trucks / containers carrying aggregates (such as sand, gravel, or crushed stone) brought to the RMC plant shall be first passed through water sprinklers to minimize dusting during unloading of the material in the storage area.

III. All aggregates (such as sand, gravel, or crushed stone) shall be stored in a closed shed (three sides and top shall be closed). Also, materials shall be covered by a flexible tarpaulin / synthetic fibre / plastic sheet to prevent fugitive dusting under closed shed. In order to safeguard the structure due to wind, it should be designed in such a way that gap for passing wind should be optimum.

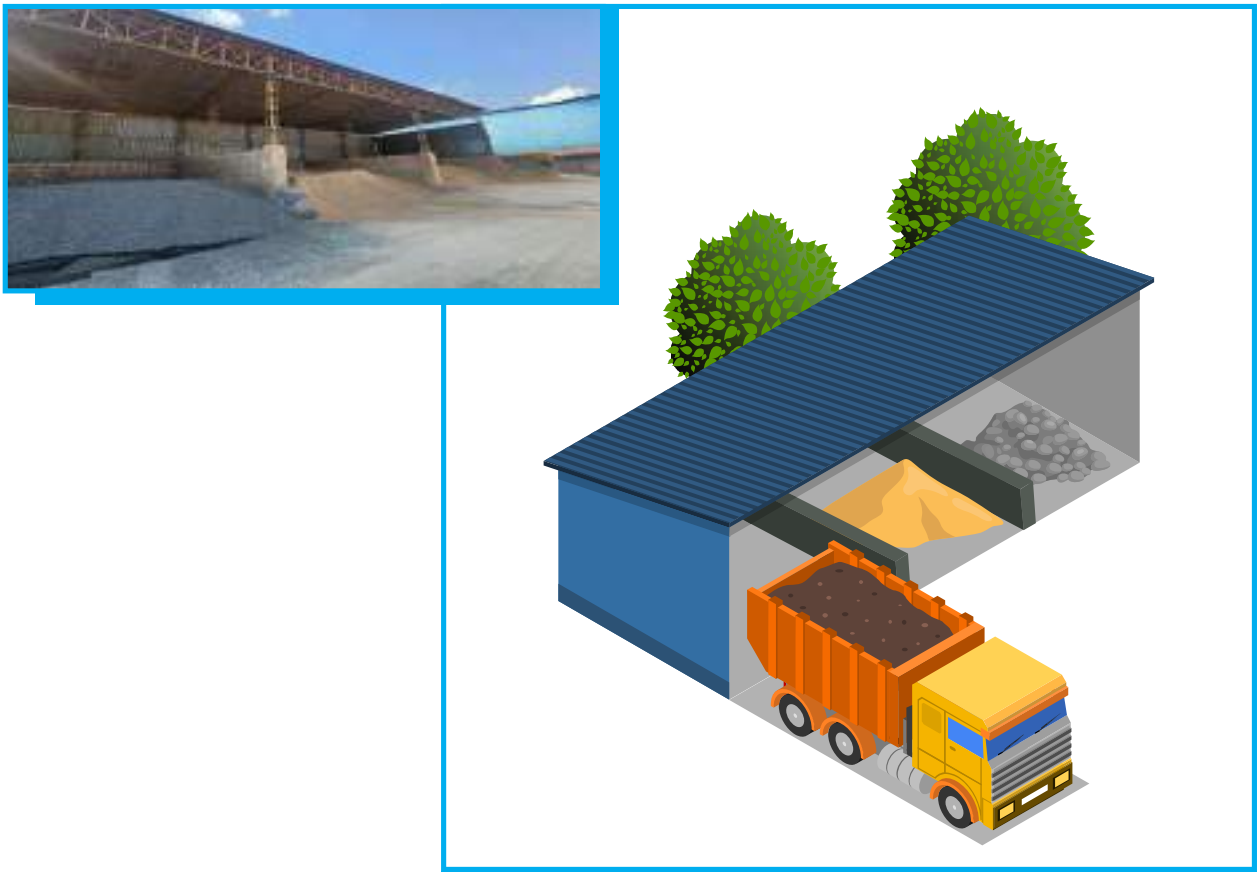


Figure 4: Raw material storage shed covered by three sides and top

IV. The side walls of the storage shed should be at least two (02) meters higher than the height of the heap of material stored.

V. Water sprinklers / fogging systems shall be installed for dust suppression and shall cover the whole material storage area. Periodic water sprinkling / fogging applications are required to reduce fine dust emissions.

VI. Weigh bins and hoppers shall be covered by GI / MS sheet on three sides and the top where the front-end loader is used.

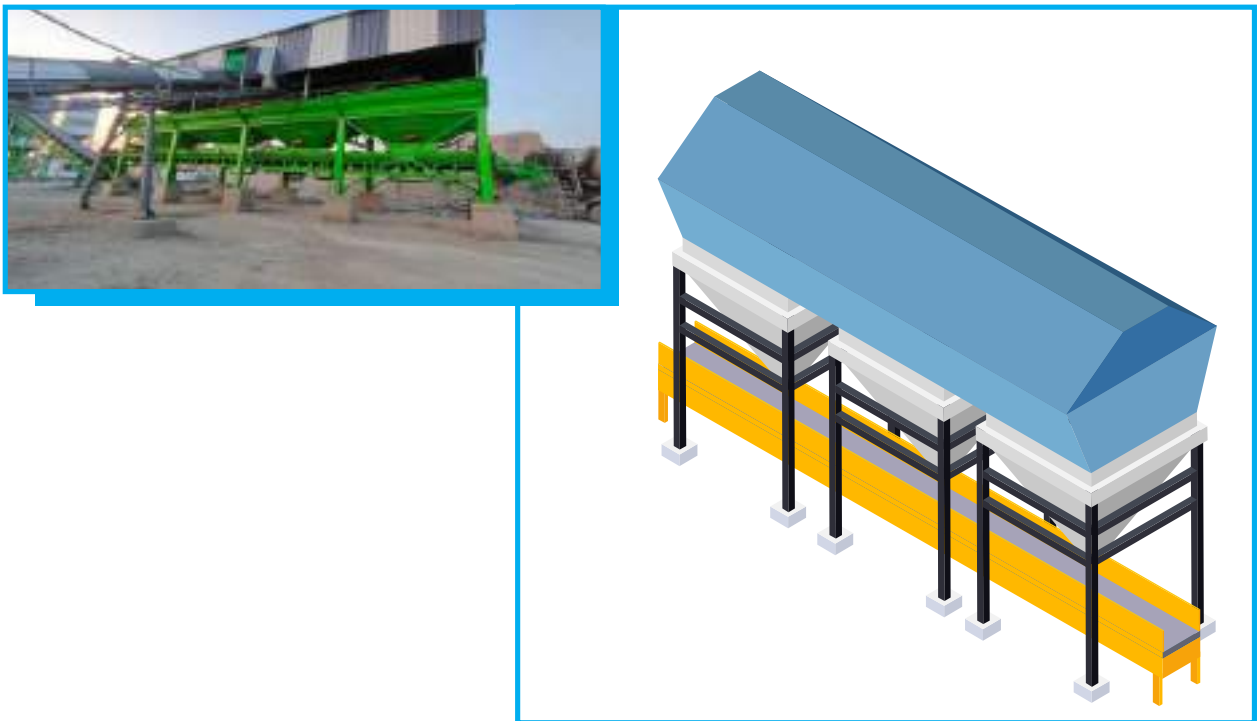


Figure 5: Weigh bins and hoppers covered by GI sheet

VII. Conveyor belts shall be completely covered by GI / MS / FRP sheet. Unit shall ensure there shall be no gap left for dust escape. Gaps left for maintenance purpose shall be covered with fabric / synthetic sheets to minimize dusting.

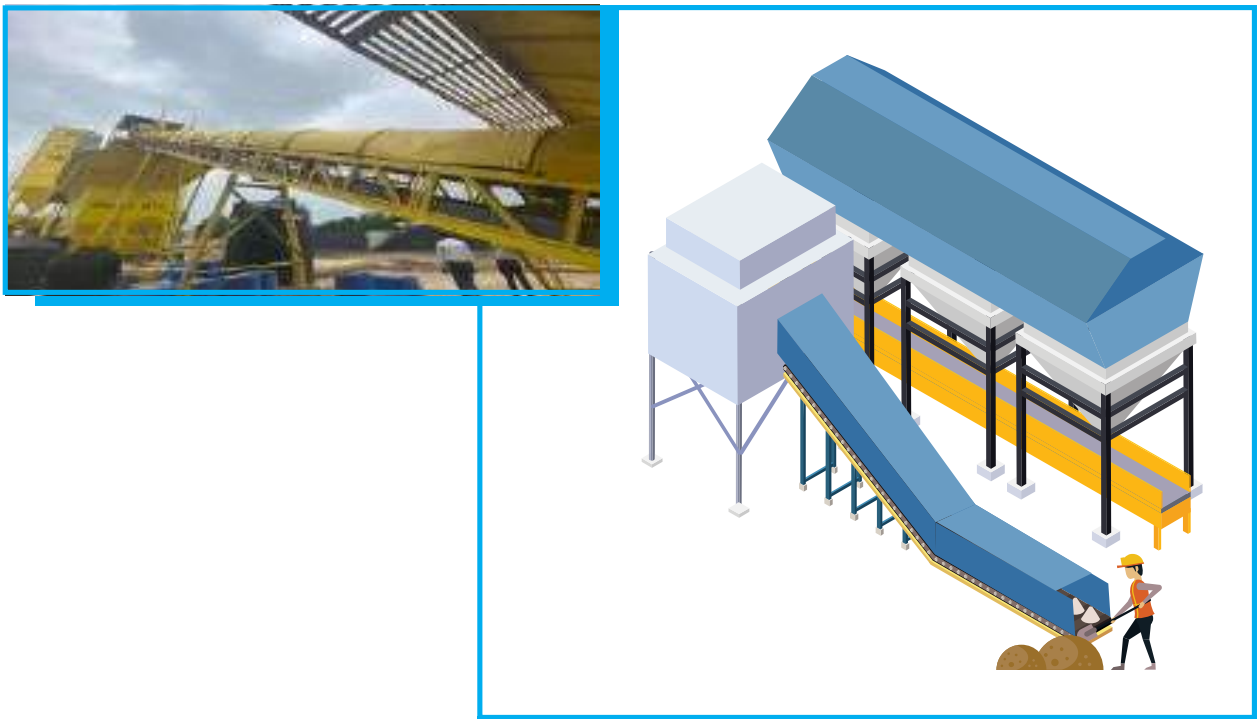


Figure 6: Conveyor belt covered by GI sheet

VIII. Cement, fly ash, GGBS etc. should be transported through bulker by a raw material supplier to minimize plastic waste and dust emissions.

IX. Only a pneumatic system shall be used to load the cement, fly ash, GGBS etc. into the silo.

X. Cement, fly ash, GGBS etc. storage silos shall have an adequate dust collection system, such as a bag filter. Dust collected from a bag filter shall be used for construction purpose or suitably reused. Filter bags' material and pore size shall be selected based on particle size distribution of cement, fly ash, GGBS etc. in order to maintain efficiency above 99% and to comply with the norms. Bags should be changed periodically to maintain efficiency and records shall be maintained for the same. Stack height of stack attached to bag filters shall be minimum eleven (11) meters or two (02) meters more than the highest node of the plant (whichever is higher). Bag filters shall have proper enclosure with a monitoring gate with gasket for monitoring purposes in the filter section and hopper area.

XI. Transfer of cement, fly ash, GGBS etc. from silo to mixer shall be carried out through closed system only.

XII. A closed mechanized system shall be used to mix the cement, fly ash, sand, aggregate etc.

Figure 7: Closed mechanized system (mixer)

XIII. All material transfer points shall be covered.

XIV. All road and vehicles movement area shall be cemented/ asphalted/metalled. Ramp and the entire ground area inside the premises should be metalled.

XV. Daily cleaning/ removal of dust accumulation inside the plant shall be carried out by an industrial vacuum cleaner or through wet sweeping.

XVI. A tyre washing facility shall be provided to wash all vehicles (like T.M., bulkers, trucks etc.) at entry and exit of RMC factility to minimize dust emissions. Tyre washing shall be carried out whenever the vehicles come in/goes out of the premises.

XVII. Maintenance of the Pressure Relief Valve (PRV) of the silo shall be carried out periodically and records of the same shall be maintained.

XVIII. Operation of RMC plant should be interlocked with Air Pollution Control Measures (APCM).

XIX. Manual operations for transfer of cement or other raw material like microfine, ultrafine etc. (for cumulative consumption not exceeding 5 MT/day) from small bags to silo shall be permitted only in a closed shed with the adequate dust extraction system at load point and at the roof top of the shed. The dust extraction system should be vented through bag filters and stack height shall be as mentioned at point (x) above. Bag Slitting System for automated bag opening, material infeed, and product separation should be preferred instead of manual operation to rule out exposure of workers to fugitive emissions.

XX. Regular wetting of internal roads and floors should be done to suppress dust within the premises to control dust emissions & re-suspension.

XXI. A RMC plant shall have a wind breaking wall upto a height of twenty (20) feet from ground level (preferably consisting of masonry / RCC / pre-cast concrete work upto ten (10) feet height and the remaining ten (10) feet shall be covered by contiguous GI or MS or FRP sheet barrier) all around the periphery of the unit.

XXII. Sprinkling shall be carried out, if required, at regular intervals outside the premises along the vehicle movement route upto the main road to prevent fugitive emissions.

C. Wastewater Management

I. All transit mixers shall be washed inside premises and, in no case, washing shall be carried out outside the premises.

II. For the collection of wastewater generated from plant washing, transit mixer washing, vehicle tyres washing and floor washing area, an adequate size collection tank and settling tank should be provided.

III. There shall be no disposal of wastewater outside the premises; instead, it should be reused for processes like dust suppression, tyre washing or concrete preparation after necessary treatment.

D. Solid Waste Management

I. Solid waste from transit mixture washing, muck (debris/ sludge) generated from RMC shall either be reused through recovery unit/ reclaiming system OR disposed off at a designated approved site by local body, for debris / construction waste.

II. Dedicated area shall be provided for solid waste storage within the premises.

III. Solid waste generated from a plant shall be managed as per the Construction and Demolition (C & D) Waste Management Rules, 2016.

7 General Measures

I. RMC plant shall obtain Consent to Establish (CTE) before installation of plant and Consent to Operate (CTO/CCA) before operation of plant.

II. CGWA permission shall be obtained for extracting groundwater from borewell. All the conditions prescribed in such permission should be complied all the time.

III. Dyke walls shall be provided in an admixture storage area.

IV. The Off-site RMC plant shall have a sensor-based PM monitoring system to measure ambient air quality as a part of self-monitoring.

V. Any dumping of materials / waste at open area shall be prohibited. Open pit is strictly prohibited for any kind of material / wastewater disposal.

VI. All equipment, plant and machinery and silos should be painted properly and maintained so as to prevent them from rusting/ leakage resulting into spills/ fugitive emissions.

VII. Maintenance and cleaning schedules shall be prepared. Preventive and corrective maintenance shall be carried out regularly.

VIII. Maintain good housekeeping practice in order to control the fugitive dust emission.

IX. Vehicles carrying any kind of material should be properly covered and leakproof. The vehicle should carry details of origin (RMC plant location) and destination (construction site) with all relevant contact details.

X. It is preferable to operate RMC plant in the daytime.

XI. All the machineries shall be maintained in good condition in order to control noise pollution as well and shall always comply with the permissible limits as per Noise Pollution (Regulation and Control) Rules -2000.

XII. Alternative power back up if provided, shall compulsorily cover both production and air pollution control measures.

8 Additional Measures and Documentation required for on-site RMC Plant

I. On-site RMC plant needs to furnish valid documents for work allotment / tender conditions for the installation of the plant at that site. The validity of such On-site RMC plant shall commensurate with the time limit of the project or maximum of three (3) years from date of commissioning of plant. After completion of such project, on-site RMC plans shall be dismantled. Notarized undertaking regarding validity of project with plant dismantling condition shall be submitted along with application.

II. On-site RMC plants shall have mist cannon / anti-smog guns with tilting and turning options placed in such numbers and at such locations (at-least minimum two locations) for dust suppression. Mist cannon / anti-smog guns may be operated on an intermittent basis to optimize the use of water and energy.

9 References

I. https://en.wikipedia.org/wiki/Concrete#:~:text=Concrete%20is%20the%20second%2Dmost,%2C%20plastics%2C%20and%20aluminium%20combined.

II. Kashwani, Ghanim & Liu, Engui & Atif, Abdulrhman. (2019). Safety Review of the Quality Ready-Mix Concrete (RMC) and Workmanship in the Construction Industry. 1-8. 10.5923/j.safety.20190801.01.

III. A. M. Neville, J.J. Brooks, Concrete Technology, 2nd edition, Pearson.

IV. Kandasami, S. (2015). Concrete Mix Design, Quality Control and Specification, 4th edn. K. W. Day, J. Aldred and B. Hudson (eds). CRC Press, London, UK, 2014, ISBN 978-0-415-50499-7, £125·00, 329 pp. Proceedings of the Institution of Civil Engineers - Construction Materials, 168(6), 288–288. https://www.ribabooks.com/concrete-mix-design-quality-control-and-specification_9780415504997.


GPCB

GPCB

Gujarat Pollution Control Board

Paryavaran Bhavan, Sector-10A,
Gandhinagar-382010.
Gujarat

Phone : (079) 2323 2152
Website: https://gpcb.gujarat.gov.in/